



SSME

Space Shuttle
Main Engine

Return to Flight

SPOTLIGHT

Space Shuttle Main Engine (SSME)



SSME undergoing hot fire testing at SSC



SSC test stand directing the SSME's steam exhaust



STS-114 flight engine at KSC



SSME flight nozzle fabrication

Completes Acceptance Testing

The three main engines for Discovery's STS-114 Return to Flight mission recently completed acceptance testing at NASA's Stennis Space Center (SSC) in Bay St. Louis, Mississippi. The tests simulate conditions typical and beyond those encountered during a nominal mission to thoroughly evaluate the engine's performance envelop and flight readiness. Post-test inspections and checkouts were also performed to further confirm the engines' flight acceptability. All three engines have been delivered to NASA's Kennedy Space Center (KSC) Space Shuttle Main Engine Processing Facility (SSMEPF) for final processing. Engine installation into Discovery is planned for late 2004. The three engines are flight veterans. Main engine 2057, 2054 and 2056 (allocated to engine position #1, #2 and #3) have flown on three, eight and seven previous missions, respectively.

The SSME is the world's most reliable and highly tested rocket engine, having accumulated in excess of one million seconds of development, certification and flight time. The engine was designed to meet the demanding requirements of the Space Shuttle, specifically high thrust-to-weight and specific impulse performance, full reusability, and rating for human transportation. The SSME is also the first booster engine utilizing a digital controller to perform all command and control functions, including self-diagnostic health checks. Other unique features include full throttling capability in one percent thrust increments and gimbaling in the x-y planes to provide precise vehicle control during ascent.

Discovery's engines are the newest Block II configuration that incorporates all the latest reliability and safety enhancements developed and certified in the past decade. The Block II SSME operates in a de-rated environment that provides increased safety margins to maximum design limits. New materials, manufacturing processes and design tools were also incorporated into upgraded components to further improve their robustness and supportability. These enhancements collectively are estimated to double the reliability of the engine, compared to previous configurations.

The SSME Project completed a major return to flight milestone by successfully conducting the SSME Design Certification Review, September 28-29, 2004. The review demonstrated the flight configuration, return to flight open actions, integration activities, technical issues, deviation approval requests and waivers, and safety and mission assurance activities all validate the flight worthiness of the SSME for use in return to flight.

In addition to Discovery's engine set, another SSME set for Atlantis' STS-121 mission and a spare set are expected to be ready at KSC for return to flight.

The SSME Project is managed by NASA's Marshall Space Flight Center (MSFC) with Boeing's Rocketdyne Propulsion & Power as the SSME prime system contractor. Major subcontractors include Pratt & Whitney for the high-pressure turbopumps, Honeywell for the controller, and Hydraulic Research Textron for the valve actuators.

Statistics:

Size:	168 in. long by 96 in. wide
Weight (dry):	7,770 lb
Maximum Thrust (109% Power Level):	512,300 lb
Nominal Thrust at Liftoff:	396,600 lb
Chamber Pressure:	2,990 psia
Specific Impulse (Vacuum):	452 sec
Mixture Ratio (Oxygen/Hydrogen):	6.03:1
Throttle Range (% Power Level):	67 to 109
Gimbal Angle:	+/- 10.5 deg
Operating Pressures:	40 to 7,270 psia
Operating Temperatures:	-423 to +6,000 F

Cover Photo:

Close-up of the SSME's during a night launch. Note the supersonic mach diamonds.



For more information, visit the NASA website at <http://www.nasa.gov>